

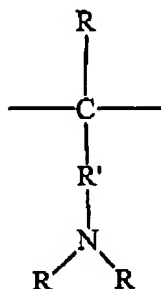
Appl. No. 10/826,979
Atty. Docket No. 2003B050A
Amdmt. dated January 30, 2006
Reply to Office Action of September 28, 2005

Amendments to the Claims

This listing of claims will replace all prior versions and listing of claims in this application.

Listing of Claims:

1. (Currently Amended) A laminate comprising:
an ionomer layer and
a tie-layer comprising a (co)extrudable tie resin (CTR), wherein the CTR comprises one or more polymers or copolymers selected from the group consisting of amine-containing polymer; epoxy-containing polymer; grafted epoxy-containing polymer; polar copolymer; acidic copolymer; ester-containing polymer; polymer made from a diacid; polymer made from a monoester of an unsaturated diacid; polymer made from an anhydride of an unsaturated diacid; polymer made from carbon monoxide; polyolefin grafted with acrylic acid, and blends thereof.
2. (Original) The laminate of claim 1, wherein the CTR comprises a copolymer of one or more C₂-C₁₀ α -olefins and one or more ethylenically copolymerizable amine-containing monomers, the copolymer having amine groups that may be represented by the general formula:
where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.



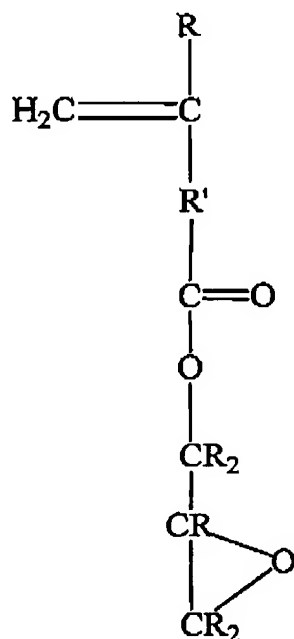
3. (Original) The laminate of claim 2, wherein R is H and R' is a bond.

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4. (Original) The laminate of claim 2, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

5. (Original) The laminate of claim 1, wherein the CTR comprises an epoxy-containing polymer comprising a copolymer of C₂-C₁₀ α-olefins and epoxy-containing monomers.

6. (Original) The laminate of claim 5, wherein the epoxy-containing monomer is represented by the general formula:



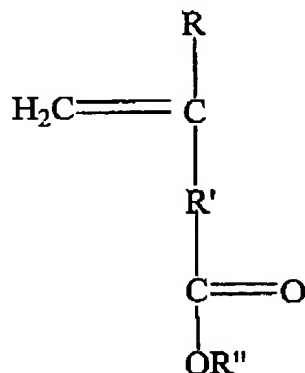
where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is independently a bond or a C₁ to C₁₀ hydrocarbon.

7. (Original) The laminate of claim 5, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

8. (Original) The laminate of claim 5, wherein the epoxy-containing monomers are selected from the group consisting of glycidyl acrylate and glycidyl methacrylate.

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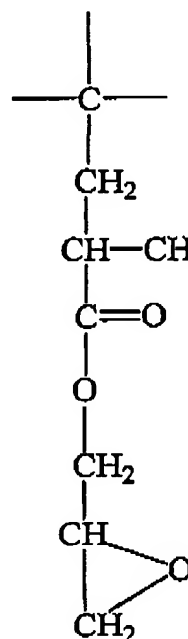
9. (Original) The laminate of claim 5, wherein the copolymer further comprises an ester monomer represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon; each R' is independently a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

10. (Original) The laminate of claim 9, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

11. (Original) The laminate of claim 1, wherein the CTR comprises a grafted, epoxy-containing polymer represented by the general formula:



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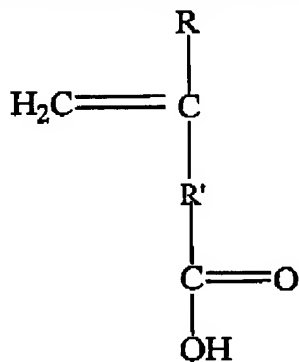
12. (Original) The laminate of claim 1, wherein the CTR comprises a grafted, epoxy-containing polymer produced by grafting epoxy-containing monomers onto C₂-C₁₀ α-olefins polymers.

13. (Original) The laminate of claim 12, wherein the C₂-C₁₀ α-olefins polymers are ethylene and/or propylene polymers.

14. (Original) The laminate of claim 1, wherein the CTR comprises an epoxy-containing polymer, the epoxy-containing polymer comprising glycidyl methacrylate grafted onto polyethylene or a copolymer of ethylene with one or more ester monomers selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate and butyl (meth)acrylate.

15. (Original) The laminate of claim 1, wherein the CTR comprises an acidic copolymer.

16. (Original) The laminate of claim 14, wherein the acidic copolymer is a bipolymer of C₂-C₁₀ α-olefins and acidic monomers represented by the general formula:



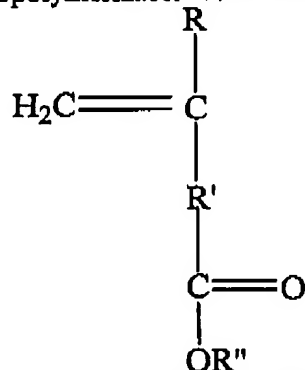
where R is H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

17. (Original) The laminate of claim 16, where the C₂-C₁₀ α-olefins are ethylene and/or propylene.

18. (Original) The laminate of claim 15, wherein the acidic copolymer is a bipolymer of ethylene and/or propylene and acrylic acid and/or methacrylic acid.

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19. (Original) The laminate of claim 1, wherein the CTR comprises a bipolymer of C₂-C₁₀ α-olefins and ethylenically copolymerizable ester monomers represented by the general formula:

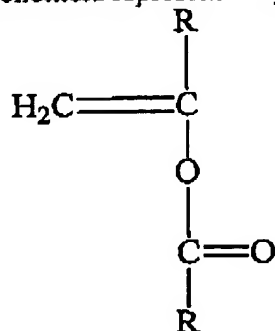


where R is H or a C₁ to C₁₀ hydrocarbon; R' is a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

20. (Original) The laminate of claim 19, where the C₂-C₁₀ α-olefins are ethylene and/or propylene.

21. (Original) The laminate of claim 19, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

22. (Original) The laminate of claim 1, wherein the CTR comprises a copolymer of C₂-C₁₀ α-olefins and vinyl ester monomers represented by the formula:

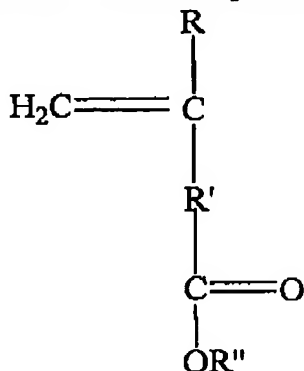


where each R is independently H or a C₁ to C₁₀ hydrocarbon.

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23. (Original) The laminate of claim 22, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

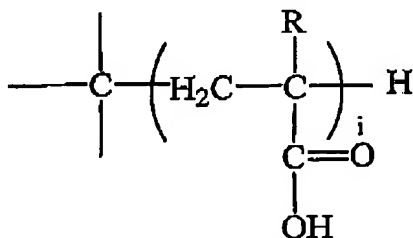
24. (Original) The laminate of claim 22, wherein the copolymer further comprises another ester monomer, the another ester monomer represented by the general formula:



wherein R is H or a C₁ to C₁₀ hydrocarbon; R' is a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

25. (Original) The laminate of claim 1, wherein the CTR comprises a copolymer of ethylene and/or propylene and vinyl acetate, optionally copolymerized with butyl (meth)acrylate.

26. (Original) The laminate of claim 1, wherein the CTR comprises grafted polymers of C₂-C₁₀ α-olefins, ethylene vinyl ester copolymers (based on from C₁ to C₁₀ acids), ethylene (meth)acrylate ester copolymers (made from C₁ to C₁₀ alcohols) and a (meth)acrylic acid group, the (meth)acrylic acid group represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon and i is from 1 to 5.

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27. (Original) The laminate of claim 26, wherein the C₂-C₁₀ α -olefins are ethylene and/or propylene.

28. (Original) The laminate of claim 1, wherein the CTR comprises a polymer made with an unsaturated diacid.

29. (Original) The laminate of claim 28, wherein the unsaturated diacid is selected from the group consisting of maleic acid, itaconic acid, citraconic acid, and 2-pentenedioic acid.

30. (Original) The laminate of claim 1, wherein the CTR comprises a polymer made with an anhydride of an unsaturated diacid.

31. (Original) The laminate of claim 30, the anhydride is selected from the group consisting of maleic anhydride, itaconic anhydride, citraconic anhydride, and 2-pentendioic anhydride.

32. (Original) The laminate of claim 1, wherein the CTR comprises a polymer made with a monoester of an unsaturated diacid.

33. (Original) The laminate of claim 32, wherein the monoester is selected from the group consisting of a monoester of maleic acid, a monoester of itaconic acid, a monoester of citraconic acid, and a monoester of 2-pentenedioic acid.

34. (Original) The laminate of claim 1, wherein the CTR is selected from the group consisting of an amine-containing polymer, an epoxy-containing polymer, a polar copolymer, a polymer made from an unsaturated diacid, a polymer made from a monoester of an unsaturated diacid, a polymer made from an anhydride of an unsaturated diacid, and a polyolefin grafted with (meth)acrylic acid.

35. (Original) The laminate of claim 1, wherein the CTR is selected from the group consisting of an amine-containing polymer, an epoxy-containing polymer, an ester polymer, a vinyl ester polymer, a polymer made from an unsaturated diacid, a polymer made from a monoester of an

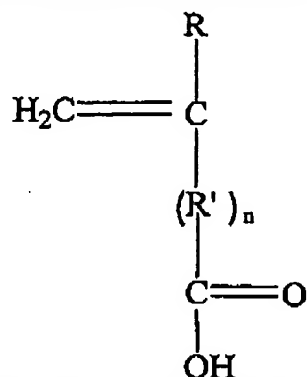
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unsaturated diacid, a polymer made from an anhydride of an unsaturated diacid, and a polyolefin grafted with (meth)acrylic acid.

36. (Original) The laminate of claim 1, wherein the tie-layer comprises a blend of a maleated polypropylene and an acid polymer.

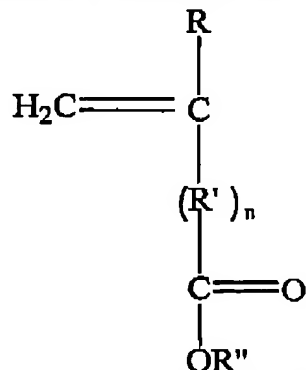
37. (Original) The laminate of claim 1, wherein the CTR comprises a copolymer of one or more C₂ to C₁₀ α-olefins and carbon monoxide.

38. (Original) The laminate of claim 37, wherein the copolymer is further copolymerized with one or more ethylenically copolymerizable acidic monomers represented by the general formula:



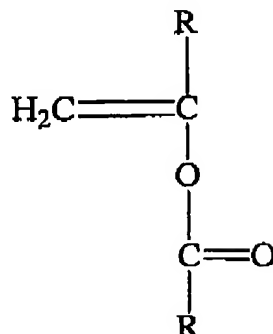
wherein R is H or a C₁ to C₁₀ hydrocarbon; R' is a C₁ to C₁₀ hydrocarbon; and n is 0 or 1.

39. (Original) The laminate of claim 37, wherein the copolymer is copolymerized with one or more ester monomers represented by the general formula:



wherein R is H or a C₁ to C₁₀ hydrocarbon; R' is a C₁ to C₁₀ hydrocarbon; R'' is a C₁ to C₁₀ hydrocarbon; and n is 0 or 1; or

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wherein each R is independently H or a C₁ to C₁₀ hydrocarbon.

40. (Original) The laminate of claim 1, wherein the ionomer layer comprises a first ionomer layer and a second ionomer layer.

41. (Original) The laminate of claim 15, wherein the first ionomer layer or the second ionomer layer is pigmented, natural, or clear.

42. (Original) The laminate of claim 1, further comprising a backing layer.

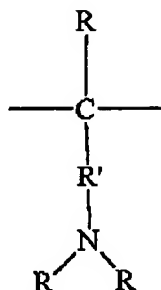
43. (Currently Amended) A composite comprising:
 an ionomer layer;

a tie-layer comprising a (co) extrudable tie resin (CTR), wherein the CTR comprises one or more polymers or copolymers selected from the group consisting of amine-containing polymer; epoxy-containing polymer; grafted, epoxy-containing polymer; polar copolymer; acidic copolymer; ester-containing polymer; polymer made from a diacid; polymer made from a monoester of an unsaturated diacid; polymer made from an anhydride of an unsaturated diacid; polymer made from carbon monoxide; polyolefin grafted with acrylic acid, and blends thereof; and

a substrate.

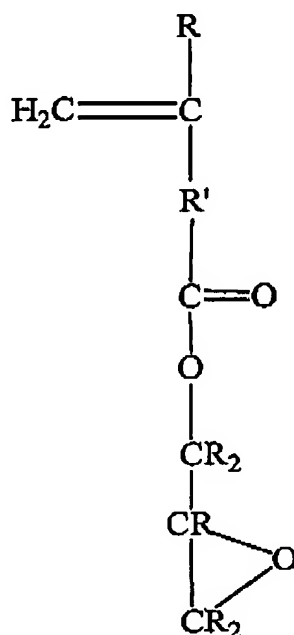
44. (Original) The composite of claim 43, wherein the CTR comprises a copolymer of one or more C₂-C₁₀ α-olefins and one or more ethylenically copolymerizable amine-containing monomers, the copolymer having amine groups that may be represented by the general formula:

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where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

45. (Original) The composite of claim 44, wherein R is H and R' is a bond.
46. (Original) The composite of claim 44, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.
47. (Original) The composite of claim 43, wherein the CTR comprises an epoxy-containing polymer comprising a copolymer of C₂-C₁₀ α-olefins and epoxy-containing monomers.
48. (Original) The composite of claim 47, wherein the epoxy-containing monomer is represented by the general formula:



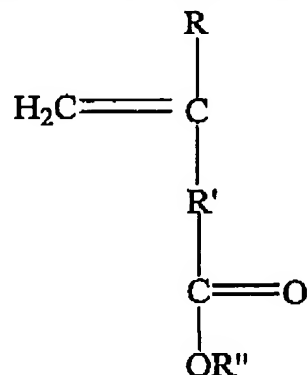
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where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is independently a bond or a C₁ to C₁₀ hydrocarbon.

49. (Original) The composite of claim 47, wherein the C₂-C₁₀ α -olefins are ethylene and/or propylene.

50. (Original) The composite of claim 47, wherein the epoxy-containing monomers are selected from the group consisting of glycidyl acrylate and glycidyl methacrylate.

51. (Original) The composite of claim 47, wherein the copolymer further comprises an ester monomer represented by the general formula:

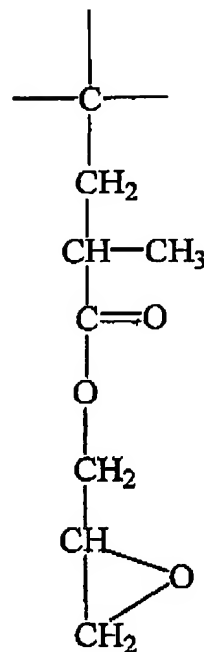


where each R is independently H or a C₁ to C₁₀ hydrocarbon; each R' is independently a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

52. (Original) The composite of claim 51, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

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53. (Original) The composite of claim 43, wherein the CTR comprises a grafted, epoxy-containing polymer represented by the general formula:



54. (Original) The composite of claim 43, wherein the CTR comprises a grafted, epoxy-containing polymer produced by grafting epoxy-containing monomers onto C₂-C₁₀ α-olefins polymers.

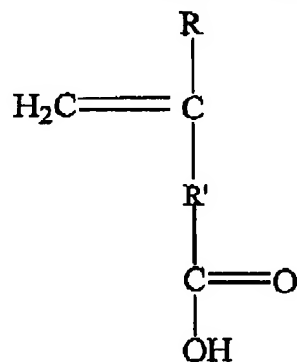
55. (Original) The composite of claim 54, where the C₂-C₁₀ α-olefins polymers are ethylene and/or propylene polymers.

56. (Original) The composite of claim 43, wherein the CTR comprises an epoxy-containing polymer, the epoxy-containing polymer comprising glycidyl methacrylate grafted onto polyethylene or a copolymer of ethylene with one or more ester monomers selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate and butyl (meth)acrylate.

57. (Original) The composite of claim 43, wherein the CTR comprises an acidic copolymers.

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58. (Original) The composite of claim 57, wherein the acidic copolymer is a bipolymer of C₂-C₁₀ α-olefins and acidic monomers represented by the general formula:

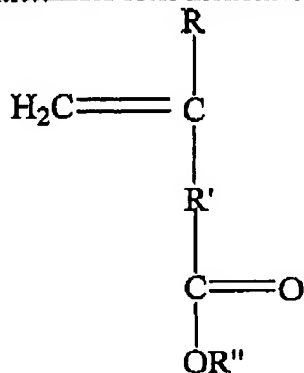


where R is H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

59. (Original) The composite of claim 58, where the C₂-C₁₀ α-olefins are ethylene and/or propylene.

60. (Original) The composite of claim 57, wherein the acidic copolymer is a bipolymer of ethylene and/or propylene and acrylic acid and/or methacrylic acid.

61. (Original) The composite of claim 43, where the CTR comprises a bipolymer of C₂-C₁₀ α-olefins and ethylenically copolymerizable ester monomers represented by the general formula:



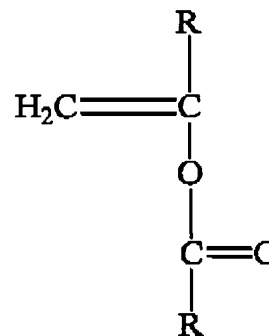
where R is H or a C₁ to C₁₀ hydrocarbon; R' is a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

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62. (Original) The composite of claim 61, where the C₂-C₁₀ α-olefins are ethylene and/or propylene.

63. (Original) The composite of claim 61, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

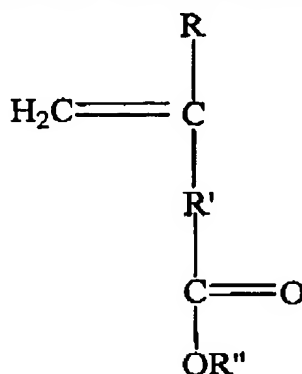
64. (Original) The composite of claim 43, wherein the CTR comprises a copolymer of C₂-C₁₀ α-olefins and vinyl ester monomers represented by the formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon.

65. (Original) The composite of claim 64, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

66. (Original) The composite of claim 64, wherein the copolymer further comprises another ester monomer, the another ester monomer represented by the general formula:



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74. (Original) The composite of claim 43, wherein the CTR comprises a polymer made with a monoester of an unsaturated diacid.

75. (Original) The composite of claim 74, wherein the monoester is selected from the group consisting of a monoester of maleic acid, a monoester of itaconic acid, a monoester of citraconic acid, and a monoester of 2-pentenedioic acid.

76. (Original) The composite of claim 43, wherein the CTR is selected from the group consisting of an amine-containing polymer, an epoxy-containing polymer, a polar copolymer, a polymer made from an unsaturated diacid, a polymer made from a monoester of an unsaturated diacid, a polymer made from an anhydride of an unsaturated diacid, and a polyolefin grafted with(meth)acrylic acid.

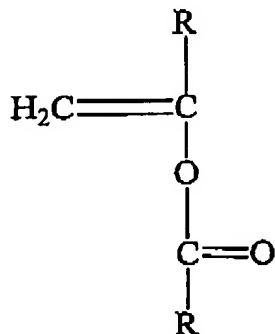
77. (Original) The composite of claim 43, wherein the CTR is selected from the group consisting of an amine-containing polymer, an epoxy-containing polymer, an ester polymer, a vinyl ester polymer, a polymer made from an unsaturated diacid, a polymer made from a monoester of an unsaturated diacid, a polymer made from an anhydride of an unsaturated diacid, and a polyolefin grafted with (meth)acrylic acid.

78. (Original) The composite of claim 43, wherein the tie-layer comprises a blend of a maleated polypropylene and an acid polymer.

79. (Original) The composite of claim 43, wherein the CTR comprises a copolymer of one or more C₂ to C₁₀ α -olefins and carbon monoxide.

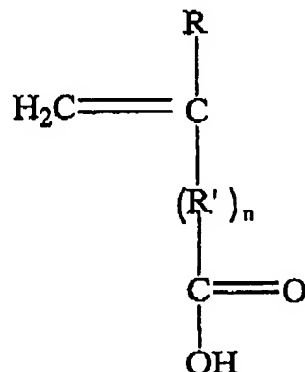
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80. (Original) The composite of claim 79, wherein the copolymer is further copolymerized with one or more ethylenically copolymerizable acidic monomers represented by the general formula:

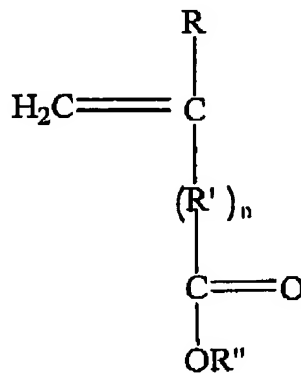


wherein R is H or a C₁ to C₁₀ hydrocarbon; R' is a C₁ to C₁₀ hydrocarbon; and n is 0 or 1.

81. (Original) The composite of claim 79, wherein the copolymer is copolymerized with one or more ester monomers represented by the general formula:



wherein R is H or a C₁ to C₁₀ hydrocarbon; R' is a C₁ to C₁₀ hydrocarbon; R'' is a C₁ to C₁₀ hydrocarbon; and n is 0 or 1; or



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wherein each R is independently H or a C₁ to C₁₀ hydrocarbon.

82. (Original) The composite of claim 43, wherein the ionomer layer comprises a first ionomer layer and a second ionomer layer.

83. (Original) The composite of claim 82, wherein the first ionomer layer or the second ionomer layer is pigmented, natural, or clear.

84. (Original) The composite of claim 43, wherein the ionomer layer comprises a zinc-neutralized ionomer or a sodium-neutralized ionomer.

85. (Original) The composite of claim 43, further comprising a backing layer.

86. (Original) The composite of claim 43, wherein the thickness of the composite article is from 200 μ m to 6 mm.

87. (Original) The composite of claim 43, wherein the substrate material is selected from EPDM (ethylene-propylene-diene monomer), EP (ethylene-propylene rubber), acrylonitrile-butadiene-styrene terpolymer, acetal polymer, acrylic polymers, cellulose, fluoroplastics, nylon and other polyamides, polyamide-imide, polycarbonate, polyester, polyetheretherketone, polyetherimide, polyethylene, polyimide, polyphenylene, polyphenylene sulfide, elastomer, polypropylene, polypropylene impact copolymers, polystyrene, polysulfone, polyurethane, polyvinyl chloride, and foams of such materials, as well as blends of these materials.

88. (Original) The composite of claim 43, wherein the substrate is a polyolefin selected from polyethylene polymers, polyethylene copolymers, polypropylene polymers, polypropylene copolymers, polypropylene impact copolymer and a blend of polypropylene impact copolymer and ethylene elastomer, and mixtures thereof.

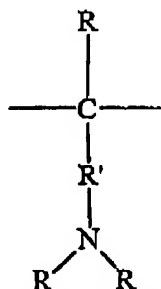
89. (Currently Amended) A composite article comprising:

a) an ionomer layer;

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- b) a tie-layer comprising a (co) extrudable tie resin (CTR), wherein the CTR comprises one or more polymers or copolymers selected from the group consisting of amine-containing polymer; epoxy-containing polymer; grafted, epoxy-containing polymer; polar copolymer; acidic copolymer; ester-containing polymer; polymer made from a diacid; polymer made from a monoester of an unsaturated diacid; polymer made from an anhydride of an unsaturated diacid; polymer made from carbon monoxide; polyolefin grafted with acrylic acid, and blends thereof;
- c) a backing layer; and
- d) a substrate.

90. (Currently amended) The composite article of claim 89 [88], wherein the CTR comprises a copolymer of one or more C₂-C₁₀ α-olefins and one or more ethylenically copolymerizable amine-containing monomers, the copolymer having amine groups that may be represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

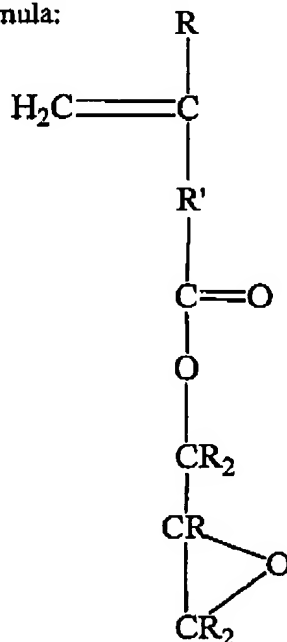
91. (Original) The composite article of claim 90, wherein R is H and R' is a bond.

92. (Original) The composite article of claim 90, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

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93. (Original) The composite article of claim 89, wherein the CTR comprises an epoxy-containing polymer comprising a copolymer of C₂-C₁₀ α-olefins and epoxy-containing monomers.

94. (Original) The composite article of claim 93, wherein the epoxy-containing monomer is represented by the general formula:



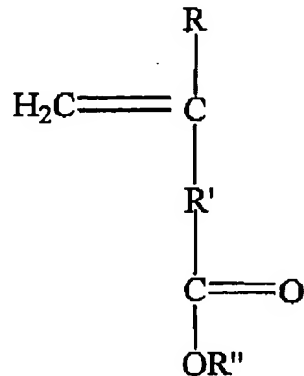
where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is independently a bond or a C₁ to C₁₀ hydrocarbon.

95. (Original) The composite article of claim 93, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

96. (Original) The composite article of claim 93, wherein the epoxy-containing monomers are selected from the group consisting of glycidyl acrylate and glycidyl methacrylate.

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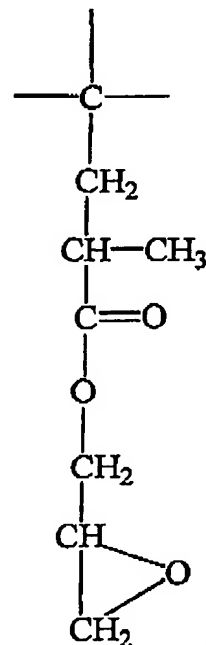
97. (Original) The composite article of claim 93, wherein the copolymer further comprises an ester monomer represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon; each R' is independently a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

98. (Original) The composite article of claim 97, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

99. (Original) The composite article of claim 89, wherein the CTR comprises a grafted, epoxy-containing polymer represented by the general formula:



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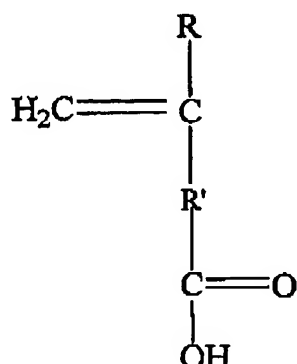
100. (Original) The composite article of claim 89, wherein the CTR comprises a grafted, epoxy-containing polymer produced by grafting epoxy-containing monomers onto C₂-C₁₀ α-olefins polymers.

101. (Original) The composite article of claim 100, where the C₂-C₁₀ α-olefins polymers are ethylene and/or propylene polymers.

102. (Original) The composite article of claim 89, wherein the CTR comprises an epoxy-containing polymer, the epoxy-containing polymer comprising glycidyl methacrylate grafted onto polyethylene or a copolymer of ethylene with one or more ester monomers selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate and butyl (meth)acrylate.

103. (Original) The composite article of claim 89, wherein the CTR comprises an acidic copolymers.

104. (Original) The composite article of claim 103, wherein the acidic copolymer is a bipolymer of C₂-C₁₀ α-olefins and acidic monomers represented by the general formula:



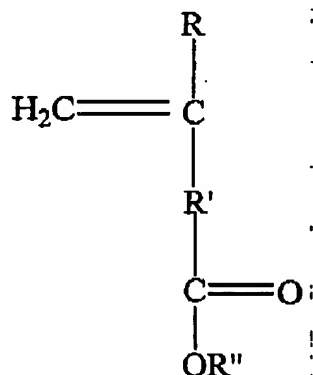
where R is H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

105. (Original) The composite article of claim 104, where the C₂-C₁₀ α-olefins are ethylene and/or propylene.

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106. (Original) The composite article of claim 103, wherein the acidic copolymer is a bipolymer of ethylene and/or propylene and acrylic acid and/or methacrylic acid.

107. (Original) The composite article of claim 89, where the CTR comprises a bipolymer of C₂-C₁₀ α-olefins and ethylenically copolymerizable ester monomers represented by the general formula:

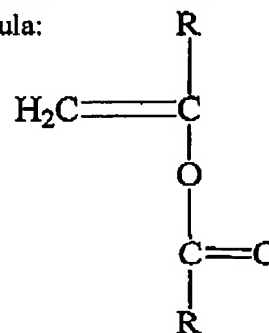


where R is H or a C₁ to C₁₀ hydrocarbon; R' is a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

108. (Original) The composite article of claim 107, where the C₂-C₁₀ α-olefins are ethylene and/or propylene.

109. (Original) The composite article of claim 107, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

110. (Original) The composite article of claim 89, wherein the CTR comprises a copolymer of C₂-C₁₀ α-olefins and vinyl ester monomers represented by the formula:

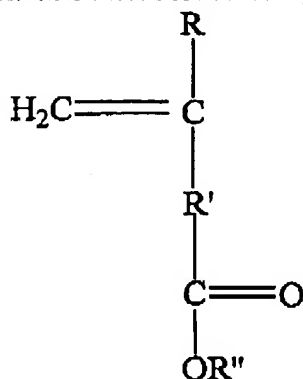


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where each R is independently H or a C₁ to C₁₀ hydrocarbon.

111. (Original) The composite article of claim 110, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

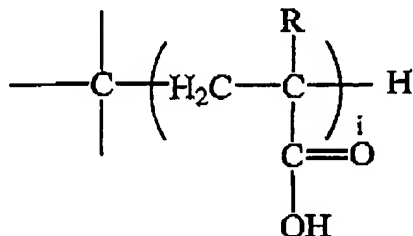
112. (Original) The composite article of claim 110, wherein the copolymer further comprises another ester monomer, the another ester monomer represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon; R' is a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

113. (Original) The composite article of claim 89, wherein the CTR comprises a copolymer of ethylene and/or propylene and vinyl acetate, optionally copolymerized with butyl (meth)acrylate.

114. (Original) The composite article of claim 89, wherein the CTR comprises grafted polymers of C₂-C₁₀ α-olefins, ethylene vinyl ester copolymers (based on from C₁ to C₁₀ acids), ethylene (meth)acrylate ester copolymers (made from C₁ to C₁₀ alcohols) and a (meth)acrylic acid group, the (meth)acrylic acid group represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon and i is from 1 to 5.

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115. (Original) The composite article of claim 114, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.
116. (Original) The composite article of claim 89, wherein the CTR comprises a polymer made with an unsaturated diacid.
117. (Original) The composite article of claim 116, wherein the unsaturated diacid is selected from the group consisting of maleic acid, itaconic acid, citraconic acid, and 2-pentenedioic acid.
118. (Original) The composite article of claim 89, wherein the CTR comprises a polymer made with an anhydride of an unsaturated diacid.
119. (Original) The composite article of claim 118, the anhydride is selected from the group consisting of maleic anhydride, itaconic anhydride, citraconic anhydride, and 2-pentendioic anhydride.
120. (Original) The composite article of claim 89, wherein the CTR comprises a polymer made with a monoester of an unsaturated diacid.
121. (Original) The composite article of claim 120, wherein the monoester is selected from the group consisting of a monoester of maleic acid, a monoester of itaconic acid, a monoester of citraconic acid, and a monoester of 2-pentenedioic acid.
122. (Original) The composite article of claim 89, wherein the CTR is selected from the group consisting of an amine-containing polymer, an epoxy-containing polymer, a polar copolymer, a polymer made from an unsaturated diacid, a polymer made from a monoester of an unsaturated diacid, a polymer made from an anhydride of an unsaturated diacid, and a polyolefin grafted with(meth)acrylic acid.
123. (Original) The composite article of claim 89, wherein the CTR is selected from the group consisting of an amine-containing polymer, an epoxy-containing polymer, an ester polymer, a vinyl ester polymer, a polymer made from an unsaturated diacid, a polymer made from a

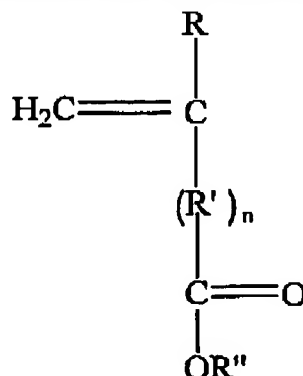
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monoester of an unsaturated diacid, a polymer made from an anhydride of an unsaturated diacid, and a polyolefin grafted with (meth)acrylic acid.

124. (Original) The composite article of claim 89, wherein the tie-layer comprises a blend of a maleated polypropylene and an acid polymer.

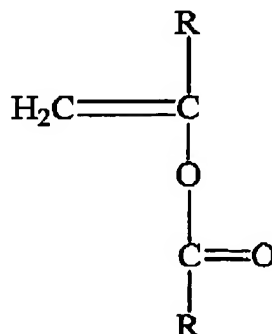
125. (Original) The composite article of claim 89, wherein the CTR comprises a copolymer of one or more C₂ to C₁₀ α-olefins and carbon monoxide.

126. (Original) The composite article of claim 125, wherein the copolymer is further copolymerized with one or more ethylenically copolymerizable acidic monomers represented by the general formula:



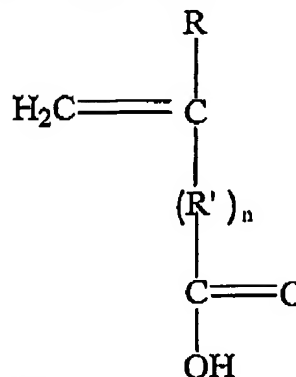
wherein R is H or a C₁ to C₁₀ hydrocarbon; R' is a C₁ to C₁₀ hydrocarbon; and n is 0 or 1.

127. (Original) The composite article of claim 125, wherein the copolymer is copolymerized with one or more ester monomers represented by the general formula:



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wherein R is H or a C₁ to C₁₀ hydrocarbon; R' is a C₁ to C₁₀ hydrocarbon; R'' is a C₁ to C₁₀ hydrocarbon; and n is 0 or 1; or



wherein each R is independently H or a C₁ to C₁₀ hydrocarbon.

128. (Original) The composite article of claim 89, wherein the ionomer layer comprises a first ionomer layer and a second ionomer layer.

129. (Original) The composite article of claim 128, wherein the first ionomer layer or the second ionomer layer is pigmented, natural, or clear.

130. (Original) The composite article of claim 89, wherein the ionomer layer comprises a zinc-neutralized ionomer or a sodium-neutralized ionomer.

131. (Original) The composite article of claim 89, further comprising a backing layer.

132. (Original) The composite article of claim 89, wherein the thickness of (Original) The composite article is from 200 μm to 6 mm.

133. (Original) The composite article of claim 89, wherein the substrate material is selected from EPDM (ethylene-propylene-diene monomer), EP (ethylene-propylene rubber), acrylonitrile-butadiene-styrene terpolymer, acetal polymer, acrylic polymers, cellulose, fluoroplastics, nylon and other polyamides, polyamide-imide, polycarbonate, polyester, polyetheretherketone, polyetherimide, polyethylene, polyimide, polyphenylene, polyphenylene sulfide, plastomer, polypropylene, polypropylene impact copolymers, polystyrene, polysulfone,

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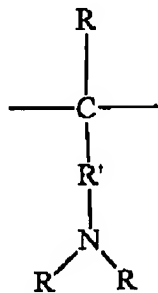
polyurethane, polyvinyl chloride, and foams of such materials, as well as blends of these materials.

134. (Original) The composite article of claim 89, wherein the substrate is a polyolefin selected from polyethylene polymers, polyethylene copolymers, polypropylene polymers, polypropylene copolymers, polypropylene impact copolymer and a blend of polypropylene impact copolymer and ethylene plastomer, and mixtures thereof.

135. (Withdrawn) A method of forming a composite article comprising:

- (a) providing a laminate comprising an ionomer layer and a tie-layer, the tie-layer comprising a (co) extrudable tie resin (CTR); and
- (b) securing a substrate to the tie-layer of the laminate to form the composite article.

136. (Withdrawn) The method of claim 135, wherein the CTR comprises a copolymer of one or more C₂-C₁₀ α-olefins and one or more ethylenically copolymerizable amine-containing monomers, the copolymer having amine groups that may be represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

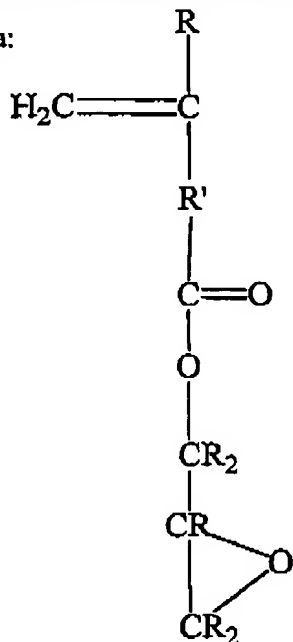
137. (Withdrawn) The method of claim 136, wherein R is H and R' is a bond.

138. (Withdrawn) The method of claim 136, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

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139. (Withdrawn) The method of claim 1, wherein the CTR comprises an epoxy-containing polymer comprising a copolymer of C₂-C₁₀ α-olefins and epoxy-containing monomers.

140. (Withdrawn) The method of claim 139, wherein the epoxy-containing monomer is represented by the general formula:



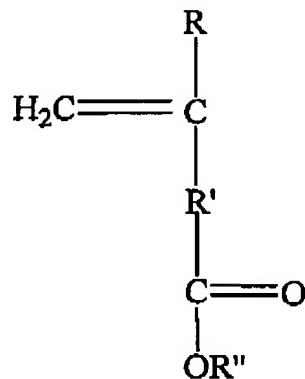
where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is independently a bond or a C₁ to C₁₀ hydrocarbon.

141. (Withdrawn) The method of claim 139, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

142. (Withdrawn) The method of claim 139 wherein the epoxy-containing monomers are selected from the group consisting of glycidyl acrylate and glycidyl methacrylate.

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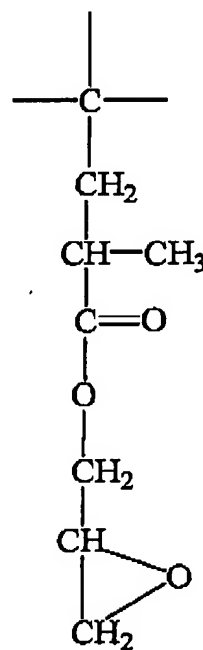
143. (Withdrawn) The method of claim 139, wherein the copolymer further comprises an ester monomer represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon; each R' is independently a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

144. (Withdrawn) The method of claim 143, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

145. (Withdrawn) The method of claim 135, wherein the CTR comprises a grafted, epoxy-containing polymer represented by the general formula:



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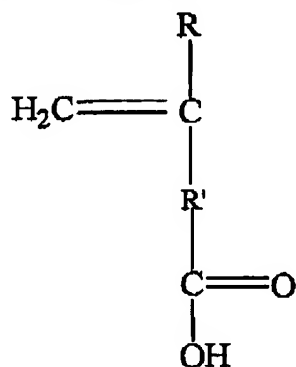
146. (Withdrawn) The method of claim 135, wherein the CTR comprises a grafted, epoxy-containing polymer produced by grafting epoxy-containing monomers onto C₂-C₁₀ α-olefins polymers.

147. (Withdrawn) The method of claim 146, where the C₂-C₁₀ α-olefins polymers are ethylene and/or propylene polymers.

148. (Withdrawn) The method of claim 135, wherein the CTR comprises an epoxy-containing polymer, the epoxy-containing polymer comprising glycidyl methacrylate grafted onto polyethylene or a copolymer of ethylene with one or more ester monomers selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate and butyl (meth)acrylate.

149. (Withdrawn) The method of claim 135, wherein the CTR comprises an acidic copolymers.

150. (Withdrawn) The method of claim 149, wherein the acidic copolymer is a bipolymer of C₂-C₁₀ α-olefins and acidic monomers represented by the general formula:



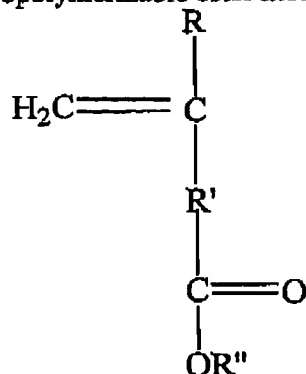
where R is H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

151. (Withdrawn) The method of claim 150, where the C₂-C₁₀ α-olefins are ethylene and/or propylene.

152. (Withdrawn) The method of claim 149, wherein the acidic copolymer is a bipolymer of ethylene and/or propylene and acrylic acid and/or methacrylic acid.

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153. (Withdrawn) The method of claim 135, where the CTR comprises a bipolymer of C₂-C₁₀ α-olefins and ethylenically copolymerizable ester monomers represented by the general formula:

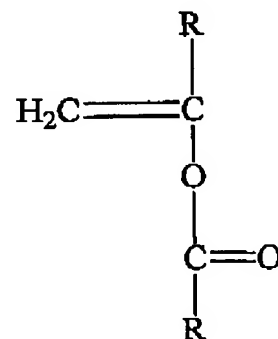


where R is H or a C₁ to C₁₀ hydrocarbon; R' is a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

154. (Withdrawn) The method of claim 153, where the C₂-C₁₀ α-olefins are ethylene and/or propylene.

155. (Withdrawn) The method of claim 153, wherein the CTR ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

156. (Withdrawn) The method of claim 135, wherein the CTR comprises a copolymer of C₂-C₁₀ α-olefins and vinyl ester monomers, represented by the formula:

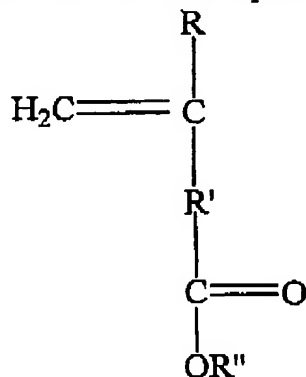


where each R is independently H or a C₁ to C₁₀ hydrocarbon.

157. (Withdrawn) The method of claim 156, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

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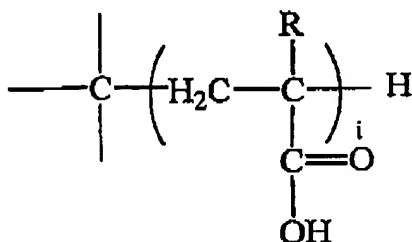
158. (Withdrawn) The method of claim 156, wherein the copolymer further comprises another ester monomer, the another ester monomer represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon; R' is a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

159. (Withdrawn) The method of claim 135, wherein the CTR comprises a copolymer of ethylene and/or propylene and vinyl acetate, optionally copolymerized with butyl (meth)acrylate.

160. (Withdrawn) The method of claim 135, wherein the CTR comprises grafted polymers of C₂-C₁₀ α-olefins, ethylene vinyl ester copolymers (based on from C₁ to C₁₀ acids), ethylene (meth)acrylate ester copolymers (made from C₁ to C₁₀ alcohols) and a (meth)acrylic acid group, the (meth)acrylic acid group represented by the general formula:



where R is independently H or a C₁ to C₁₀ hydrocarbon and i is from 1 to 5.

161. (Withdrawn) The method of claim 160, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

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162. (Withdrawn) The method of claim 135, wherein the CTR comprises a polymer made with an unsaturated diacid.

163. (Withdrawn) The method of claim 162, wherein the unsaturated diacid is selected from the group consisting of maleic acid, itaconic acid, citraconic acid, and 2-pentenedioic acid.

164. (Withdrawn) The method of claim 135, wherein the CTR comprises a polymer made with an anhydride of an unsaturated diacid.

165. (Withdrawn) The method of claim 164, the anhydride is selected from the group consisting of maleic anhydride, itaconic anhydride, citraconic anhydride, and 2-pentendioic anhydride.

166. (Withdrawn) The method of claim 135, wherein the CTR comprises a polymer made with a monoester of an unsaturated diacid.

167. (Withdrawn) The method of claim 166, wherein the monoester is selected from the group consisting of a monoester of maleic acid, a monoester of itaconic acid, a monoester of citraconic acid, and a monoester of 2-pentenedioic acid.

168. (Withdrawn) The method of claim 135, wherein the CTR is selected from the group consisting of an amine-containing polymer, an epoxy-containing polymer, a polar copolymer, a polymer made from an unsaturated diacid, a polymer made from a monoester of an unsaturated diacid, a polymer made from an anhydride of an unsaturated diacid, and a polyolefin grafted with(meth)acrylic acid.

169. (Withdrawn) The method of claim 135, wherein the CTR is selected from the group consisting of an amine-containing polymer, an epoxy-containing polymer, an ester polymer, a vinyl ester polymer, a polymer made from an unsaturated diacid, a polymer made from a monoester of an unsaturated diacid, a polymer made from an anhydride of an unsaturated diacid, and a polyolefin grafted with(meth)acrylic acid.

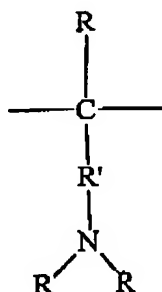
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170. (Currently Amended) A composite article formed by the method comprising:

- (a) providing a laminate comprising an ionomer layer and a tie-layer comprising a (co)extrudable tie resin (CTR), wherein the CTR comprises one or more polymers or copolymers selected from the group consisting of amine-containing polymer; epoxy-containing polymer; grafted, epoxy-containing polymer; polar copolymer; acidic copolymer; ester-containing polymer; polymer made from a diacid; polymer made from a monoester of an unsaturated diacid; polymer made from an anhydride of an unsaturated diacid; polymer made from carbon monoxide; polyolefin grafted with acrylic acid, and blends thereof;
- (b) forming a shape from the laminate, resulting in a shaped laminate; and
- (c) securing a substrate material to the shaped laminate.

171. (Original) The composite article of claim 170, wherein the laminate is thermoformed.

172. (Original) The composite article of claim 170, wherein the CTR comprises a copolymer of one or more C₂-C₁₀ α -olefins and one or more ethylenically copolymerizable amine-containing monomers, the copolymer having amine groups that may be represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

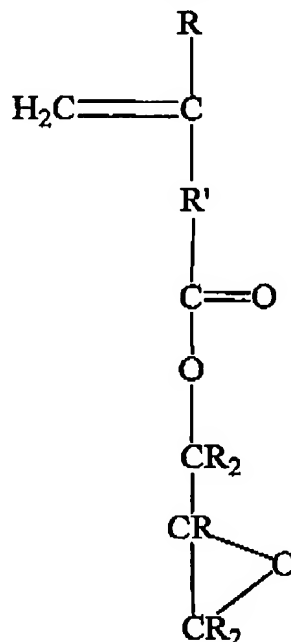
173. (Original) The composite article of claim 172, wherein R is H and R' is a bond.

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174. (Original) The composite article of claim 172, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

175. (Original) The composite article of claim 170, wherein the CTR comprises an epoxy-containing polymer comprising a copolymer of C₂-C₁₀ α-olefins and epoxy-containing monomers.

176. (Original) The composite article of claim 175, wherein the epoxy-containing monomer is represented by the general formula:



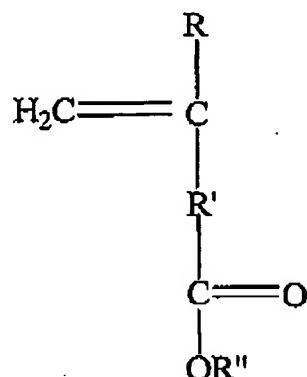
where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is independently a bond or a C₁ to C₁₀ hydrocarbon.

177. (Original) The composite article of claim 175, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

178. (Original) The composite article of claim 175, wherein the epoxy-containing monomers are selected from the group consisting of glycidyl acrylate and glycidyl methacrylate.

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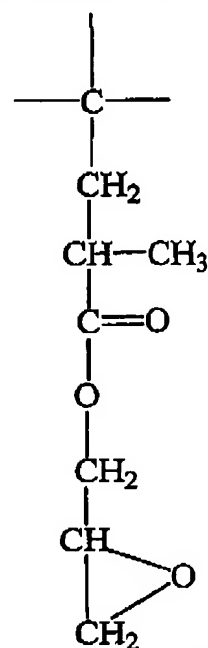
179. (Original) The composite article of claim 175, wherein the copolymer further comprises an ester monomer represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon; each R' is independently a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

180. (Original) The composite article of claim 179, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

181. (Original) The composite article of claim 170, wherein the CTR comprises a grafted, epoxy-containing polymer represented by the general formula:



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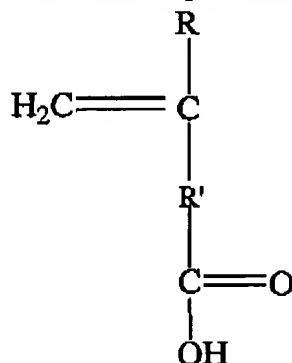
182. (Original) The composite article of claim 170, wherein the CTR comprises a grafted, epoxy-containing polymer produced by grafting epoxy-containing monomers onto C₂-C₁₀ α-olefins polymers.

183. (Original) The composite article of claim 182, where the C₂-C₁₀ α-olefins polymers are ethylene and/or propylene polymers.

184. (Original) The composite article of claim 170, wherein the CTR comprises an epoxy-containing polymer, the epoxy-containing polymer comprising glycidyl methacrylate grafted onto polyethylene or a copolymer of ethylene with one or more ester monomers selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate and butyl (meth)acrylate.

185. (Original) The composite article of claim 170, wherein the CTR comprises an acidic copolymer.

186. (Original) The composite article of claim 185, wherein the acidic copolymer is a bipolymer of C₂-C₁₀ α-olefins and acidic monomers represented by the general formula:



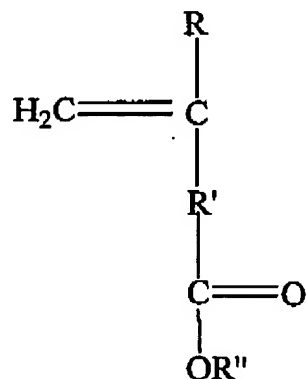
where R is H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

187. (Original) The composite article of claim 186, where the C₂-C₁₀ α-olefins are ethylene and/or propylene.

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188. (Original) The composite article of claim 185, wherein the acidic copolymer is a bipolymer of ethylene and/or propylene and acrylic acid and/or methacrylic acid.

189. (Original) The composite article of claim 170, where the CTR comprises a bipolymer of C₂-C₁₀ α-olefins and ethylenically copolymerizable ester monomers, represented by the general formula:

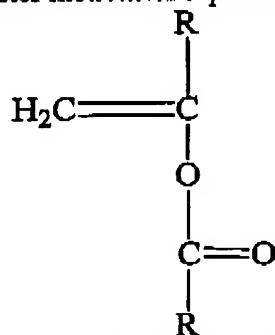


where R is H or a C₁ to C₁₀ hydrocarbon; R' is a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

190. (Original) The composite article of claim 189, where the C₂-C₁₀ α-olefins are ethylene and/or propylene.

191. (Original) The composite article of claim 189, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

192. (Original) The composite article of claim 170, wherein the CTR comprises a copolymer of C₂-C₁₀ α-olefins and vinyl ester monomers represented by the formula:

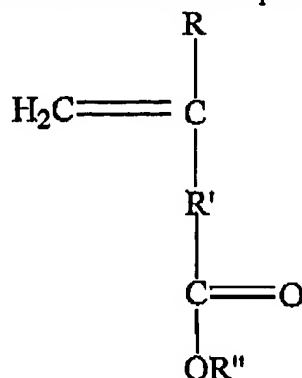


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where each R is independently H or a C₁ to C₁₀ hydrocarbon.

193. (Original) The composite article of claim 192, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

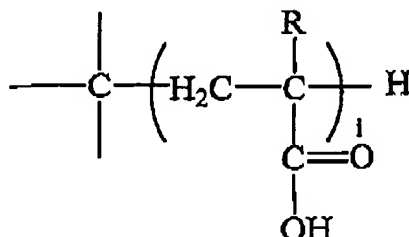
194. (Original) The composite article of claim 192, wherein the copolymer further comprises another ester monomer, the another ester monomer represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon; each R' is independently a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

195. (Original) The composite article of claim 170, wherein the CTR comprises a copolymer of ethylene and/or propylene and vinyl acetate, optionally copolymerized with butyl (meth)acrylate.

196. (Original) The composite article of claim 170, wherein the CTR comprises grafted polymers of C₂-C₁₀ α-olefins, ethylene vinyl ester copolymers (based on from C₁ to C₁₀ acids), ethylene (meth)acrylate ester copolymers (made from C₁ to C₁₀ alcohols) and a (meth)acrylic acid group, the (meth)acrylic acid group represented by the general formula:



where R is independently H or a C₁ to C₁₀ hydrocarbon and i is from 1 to 5.

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197. (Original) The composite article of claim 198, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

198. (Original) The composite article of claim 170, wherein the CTR comprises a polymer made with an unsaturated diacid.

199. (Original) The composite article of claim 198, wherein the unsaturated diacid is selected from the group consisting of maleic acid, itaconic acid, citraconic acid, and 2-pentenedioic acid.

200. (Original) The composite article of claim 170, wherein the CTR comprises a polymer made with an anhydride of an unsaturated diacid.

201. (Original) The composite article of claim 200, the anhydride is selected from the group consisting of maleic anhydride, itaconic anhydride, citraconic anhydride, and 2-pentendioic anhydride.

202. (Original) The composite article of claim 170, wherein the CTR comprises a polymer made with a monoester of an unsaturated diacid.

203. (Original) The composite article of claim 202, wherein the monoester is selected from the group consisting of a monoester of maleic acid, a monoester of itaconic acid, a monoester of citraconic acid, and a monoester of 2-pentenedioic acid.

204. (Original) The composite article of claim 170, wherein the CTR is selected from the group consisting of an amine-containing polymer, an epoxy-containing polymer, a polar copolymer, a polymer made from an unsaturated diacid, a polymer made from a monoester of an unsaturated diacid, a polymer made from an anhydride of an unsaturated diacid, and a polyolefin grafted with(meth)acrylic acid.

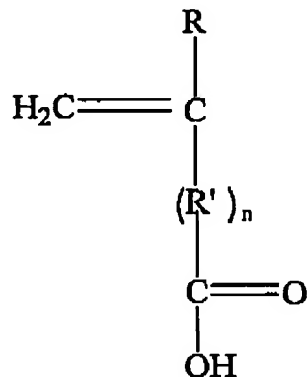
205. (Original) The composite article of claim 170, wherein the CTR is selected from the group consisting of an amine-containing polymer, an epoxy-containing polymer, an ester polymer, a vinyl ester polymer, a polymer made from an unsaturated diacid, a polymer made

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from a monoester of an unsaturated diacid, a polymer made from an anhydride of an unsaturated diacid, and a polyolefin grafted with (meth)acrylic acid.

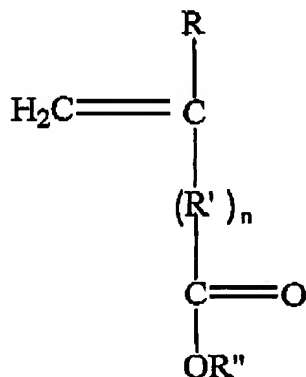
206. (Original) The composite article of claim 170, wherein the CTR comprises a copolymer of one or more C₂ to C₁₀ α-olefins and carbon monoxide.

207. (Original) The composite article of claim 206, wherein the copolymer is further copolymerized with one or more ethylenically copolymerizable acidic monomers represented by the general formula:



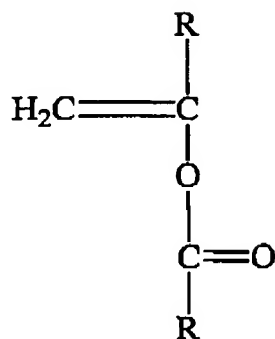
wherein R is H or a C₁ to C₁₀ hydrocarbon; R' is a C₁ to C₁₀ hydrocarbon; and n is 0 or 1.

208. (Original) The composite article of claim 206, wherein the copolymer is copolymerized with one or more ester monomers represented by the general formula:



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wherein R is H or a C₁ to C₁₀ hydrocarbon; R' is a C₁ to C₁₀ hydrocarbon; R'' is a C₁ to C₁₀ hydrocarbon; and n is 0 or 1; or



wherein each R is independently H or a C₁ to C₁₀ hydrocarbon.

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